KENTUCKY REPORT TO CONGRESS ON WATER QUALITY

1980 - 1981

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND
ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

KENTUCKY

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EXECUTIVE SUMMARY

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This report has been prepared pursuant to Section 305(b) of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), as amended by the Clean Water Act of 1977 (PL 95-217). This biennial report covers the period January 1, 1980, through December 31, 1981, and addresses the current conditions and trends in water quality in the Commonwealth of Kentucky, special water quality problems of concern, and the status of certain water pollution control programs.

I. Current Conditions and Trends in Ambient Water Quality

The Kentucky Division of Water's ambient monitoring network consists of 30 stations that are sampled monthly for a variety of physical and chemical parameters. The data produced from these stations and from the U.S. Geological Survey's network are used to determine water quality conditions for most of the major river basins in the Commonwealth. The main stem of the Ohio River is not addressed in this report, because it is addressed by the Ohio River Valley Water Sanitation Commission's 305(b) report.

The primary activities affecting water quality in Kentucky are surface coal mining, oil and gas operations, agriculture, and domestic waste discharges.

The parameters that violate standards most frequently are fecal coliform bacteria, iron, manganese, and lead. Other parameters that show occasional violations are mercury, chromium, and cadmium. These violations occur randomly throughout the state with no discernible trends. Chronic pH violations are associated with streams impacted by acid mine drainage, most notably in the Tradewater River and Green River basins.

Data on organic chemicals in the Commonwealth's waters are very limited at this time.

Fish kills are reported by the Kentucky Department of Fish and Wildlife Resources. During the 1980-81 reporting period, 50 fish kills affecting a total of 127 stream miles were investigated.

Biological integrity was monitored at seven stations in four river basins. Conditions are reported as good at 2 stations, fair at 3 stations, and poor at 2 stations. The rationale for the rating is based on periphyton, macroinvertebrate, and fish community structure; stream physical habitat conditions; and water quality. Additional information is reported on fish tissue levels of toxic materials. Four stations had levels of chlordane in fish tissue which exceeded the FDA action level for this pesticide.

Two grant awards under Section 314 of the Clean Water Act were obtained by the Kentucky Department for Natural Resources and Environmental Protection since the last 305(b) Report submittal. One award was for a Phase 1 Diagnostic/Feasibility Study on McNeely Lake in Jefferson County, Kentucky. The other was for a lake classification and prioritization study to determine the trophic state of Kentucky's public lakes and their need for restoration.

The classification study has enabled the Division of Water to undertake its first comprehensive assessment of the general condition of lakes in the state. Forty-five lakes have been classified to date. Of the 353,353 total surface acres presently classified, 74,204 acres are eutrophic, 233,213 acres are mesotrophic, and 45,936 are oligotrophic. There is documentation of impaired uses of 10 lakes. Symptoms include excessive algal blooms, extreme oxygen depletion, excessive aquatic weed growth, turbid water, elevated iron and manganese levels, and taste and odor problems.

Kentucky's wetlands are presently not being monitored as a part of a formalized program; therefore, the severity of generalized impacts and the extent of wetland loss is unknown. The major threat to wetlands appears to be their destruction due to competing land use activities and poor land management practices.

While groundwater does not provide a large portion of the total water withdrawn in the state, it is an extremely important local and regional resource because it is most often used in areas where surface supplies are not physically or economically available. Approximately one-third of Kentucky's rural population still relies on private wells for its domestic or household supply.

Though the data base is incomplete and inadequate, a number of earlier studies have served to point out existing groundwater quality problems in the Commonwealth. The failure of on-site wastewater disposal systems (especially septic tanks and tile fields) probably represents the major source of groundwater quality degradation. Other known causes of groundwater contamination include waste landfills, surface disposal lagoons, oil and gas drilling and reinjection, diminished aquifer recharge, and nonpoint source pollution.

II. Special Water Quality Problems

Pursuant to the National Interim Primary Drinking Water Regulations (NIPDWR) promulgated June 24, 1975, the amended NIPDWR promulgated August 27, 1980, and Kentucky's Public and Semipublic Drinking Water Supplies Regulations (401 KAR 6:015), the Division of Water must supervise the collection and analysis of samples taken from its community and non-community public drinking water supplies.

Data generated from 1980-81 monitoring and surveillance activities indicated elevated sodium levels in community water supplies statewide. The results of trihalomethane monitoring at the state's three community water supplies serving populations greater than 75,000 indicated that two of these systems had averages of total trihalomethane concentrations in excess of the promulgated 0.100 mg/l maximum contaminant level. A better perspective of the extent of potential trihalomethane problems in Kentucky community water supplies will develop as surveillance proceeds for the systems serving from 10,000 to 75,000 persons.

A moderate number of Kentucky's smaller communities experienced water shortages during 1980 and 1981. The principal natural cause of short-term shortages was reduced precipitation. Other contributing factors include inefficient water use and inadequate planning.

Regional surface water availability is not generally a problem in the state with the possible exception of the Ohio River sub-basin. It is reported that the critical flow for water quality already exceeds the existing 7 day 10 year low flow in three Ohio River reaches, totaling 285 stream miles, which border Kentucky. This problem is projected to worsen due to additional consumption for municipal, industrial, and power cooling uses.

A study completed in 1981 by the Division of Water made an assessment of the impact of coal mining on the water quality of streams in the coalfields of Kentucky. This study revealed that river basins in the western coalfield have a more serious acid mine drainage problem than those in the eastern coalfield. The Green River basin has the greatest number of miles of streams impacted by acid mine drainage (271 miles), while the Tradewater River basin has the greatest percentage impacted (79%).

Two major clean-up operations were funded in 1981 under the Federal "Superfund" Program at hazardous waste sites (the "Valley of the Drums" in Bullitt County and the "old Hardin County Brickyard" near West Point) posing potential problems to surface and/or groundwater quality.

III. Water Pollution Control Programs

In 1981, the Division of Water initiated a comprehensive statewide stream use classification and regulatory designation program. Where current criteria are found to be inappropriate, site-specific criteria will be recommended for approval by the state, EPA, and the public through the state's public hearing process. This effort will contribute to the mandatory triennial review and revision of the state's water quality standards and will provide a basis for future permitting, compliance assurance, and enforcement decisions. The ultimate product will be the promulgation of surface water use designations and associated criteria for the entire state.

In accordance with Section 208 of the Federal Water Pollution Control Act, PL 92-500 as amended, the Division of Water of the Kentucky Department for Natural Resources and Environmental Protection was designated as the lead agency to develop a statewide plan for the control of nonpoint source (NPS) pollution. To date, an initial plan, which is currently undergoing major revision, has been developed and was partially approved by Region IV of the U.S. Environmental Protection Agency (EPA). The plan, at this time, proposes a non-regulatory framework for implementing best management practices to address agriculture, silviculture, and construction nonpoint sources of pollution. The portion of the plan that addresses surface mining, however, is intended to be implemented within the regulatory authority granted to the Kentucky Bureau of Surface Mining Reclamation and Enforcement through acceptance of primacy for the Federal Surface Mine Control Program.

All of the state's nonpoint source assessment activities are expected to be evaluated or compared against the stream survey information being obtained through the stream use designation program. In this manner, land-based erosion information can be compared against the potential or actual use impairment of the Commonwealth's streams. The state intends on using both information sources to generate watershed treatment priorities and segment-specific water quality standards. This priority scheme is intended to identify watershed treatment priorities by the seriousness of erosion or sedimentation impacts against the relative value (in terms of beneficial use) of the Commonwealth's streams.

Kentucky signed a cooperative agreement with EPA on July 27, 1980, initiating the process of assuming primary responsibility for the Construction Grants Program in the Commonwealth. Since that time, 12 of 20 functions have been executed by the Secretary of the Department and the Regional Administrator of EPA, Region IV. Over the past two years, there have been 82 new projects initiated, which account for nearly $76 million, including: 23 Step 1 projects, 21 Step 2 projects, 30 Step 3 projects, and 8 Step 4 projects.

IV. Summary of State Problems and Needs

Recommendations were made relative to (1) continued support and development of monitoring programs to provide the necessary data base, (2) addressing special water quality problems and (3) the development and implementation of a more effective water pollution control program.

CHAPTER I

CURRENT CONDITIONS AND TRENDS IN AMBIENT WATER QUALITY

RIVERS AND STREAMS

Introduction

The Commonwealth of Kentucky comprises an approximate area of 40,598 square miles. The northern boundary is formed by the low water mark of the northern shore of the Ohio River and extends along the river from Catlettsburg in the east to the Ohio's confluence with the Mississippi River near Wickliffe in the west. The southern boundary is formed by an extension of the Virginia-North Carolina 1780 Walker Line which extends due west to the Tennessee River. Following the acquisition of the Jackson Purchase in 1818, the $30^{\circ}36'$ parallel was accepted as the southern boundary from the Tennessee River to the Mississippi River.

Kentucky's eastern boundary begins at the confluence of the Big Sandy River with the Ohio River at Catlettsburg and follows the main stem of the Big Sandy and Tug Fork southeasterly to Pine Mountain; then follows the ridge of Pine and Cumberland mountains southwest to the Tennessee line. The western boundary follows the middle of the Mississippi River and includes several of the islands in the Mississippi channel.

Kentucky is comprised of three major physiographic provinces; the Appalachian Plateaus, the Interior Low Plateaus and the Coastal Plain. The major drainage basins in the Commonwealth from east to west are the Big Sandy, Little Sandy, Tygarts, Licking, Kentucky, Upper Cumberland, Salt, Green, Tradewater, Lower Cumberland, Tennessee, and Mississippi. Most of the major rivers flow in a northwesterly direction, many of them traversing more than one major physiographic region, thus influencing the aqueous geochemistry.

The climate of Kentucky is classified as continental temperate humid. A wide range of temperatures is observed between summer and winter. Annual precipitation averages about 45 inches but varies from between 40 to 50 inches across the state. Maximum precipitation occurs during winter and spring with minimum precipitation occurring in late summer and fall. The heaviest precipitation, as well as the precipitation of longest duration, is normally associated with low pressure disturbances moving in a general southwest to northeast direction through the Ohio valley. Prolonged droughts are rarely experienced. Summers are warm and humid with an average temperature of 76°F, while winters are moderately cold with an average temperature of 34°F. Maximum snowfalls usually occur during January.

Ambient Monitoring

The Division of Water routinely monitors ambient water quality at designated sites to establish baseline data. This data is used to characterize trends in physical, chemical, and biological conditions and to provide information for decision-making by pollution control agencies.

For the reporting period (1980-1981), the physicochemical network consisted of 30 stations located in six river basins

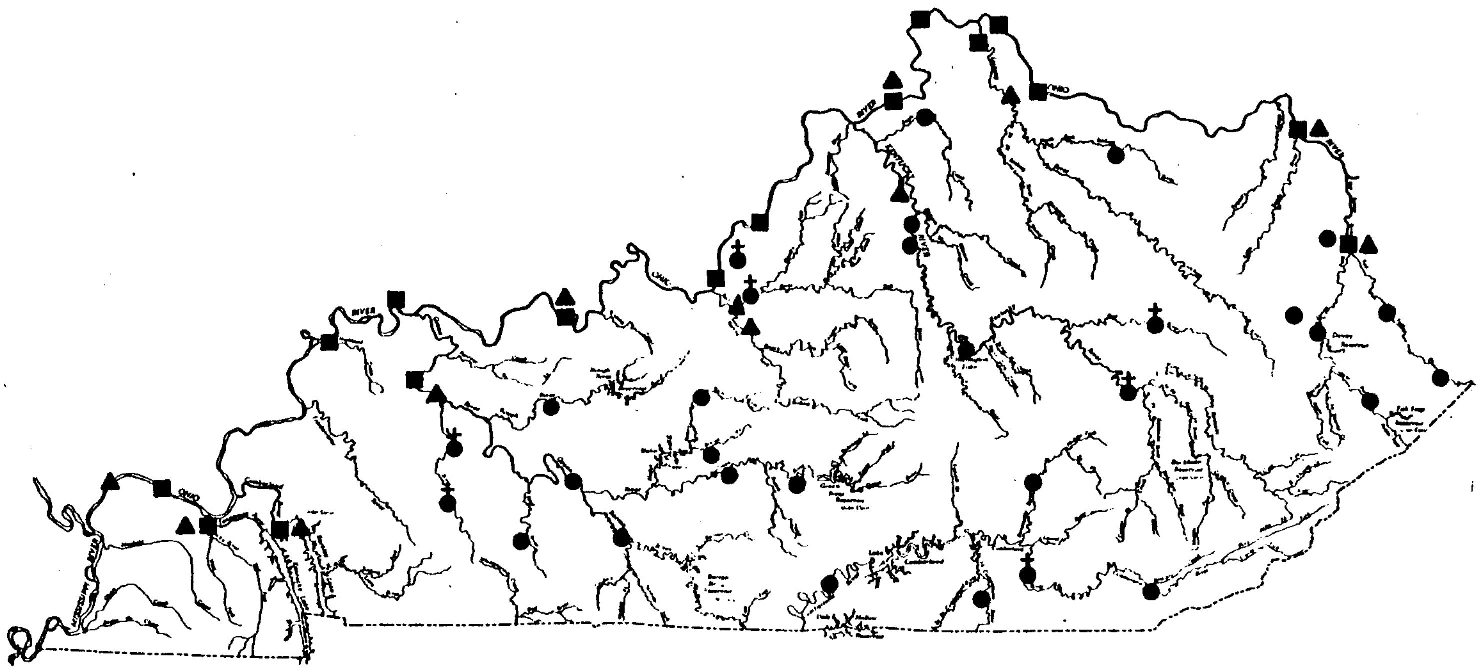
(Figure 1). Water samples collected monthly at each station are analyzed according to the parameter list shown in Table 1. In addition, the Division supports and uses data collected by the Ohio River Valley Water Sanitation Commission (ORSANCO) at eleven main stem Ohio River stations and five major tributary stations. The United States Geological Survey maintains a National Stream Quality Accounting Network (NASQAN) composed of four main stem Ohio River stations and eight major tributary stations. The Division is also participating in the U.S. Environmental Protection Agency's Basic Water Monitoring Program (BWMP) (Figure 1). Kentucky's commitment to the BWMP network consists of 7 of the Division's 30 primary network stations. In addition, 9 BWMP stations on the Ohio River are maintained by ORSANCO, for a total of 16 stations in the state.

The data generated from these monitoring efforts were analyzed and used in the development of the basin discussions and the water quality matrix, as detailed in the following section.

Existing Physicochemical Conditions

The Water Quality Index uses the following nine categories: temperature, oxygen, pH, bacteria, trophic nutrients, aesthetics, solids, and organic and inorganic toxicants. These categories were applied to the matrix for each of the major river basins. The physicochemical stations are grouped by basin and evaluated to give the overall trend and condition. The water quality parameters are assessed for standards violations.

MONITORING STATIONS



- ● DOW Primary Network
- ■ ORSANCO Network
- ▲ USGS NASQAN Network
- DOW BWMP Stations

FIGURE 1

Table 1

Ambient Monitoring Parameters

Monthly

Air Temperature	Conductivity
Water Temperature	Flow
Dissolved Oxygen	Stream Stage
pH	Turbidity
Secchi disk transparency	

Monthly

Turbidity	Arsenic, total
Conductivity	Cadmium, total and dissolved
Suspended Solids	Chromium, total and dissolved
NH_3-N	Copper, total and dissolved
NO_2+NO_3-N	Iron, total and dissolved
Total Kehldahl Nitrogen (TKN)	Lead, total and dissolved
Phosphorus (total)	Manganese, total and dissolved
Acidity	Mercury, total and dissolved
Alkalinity	Zinc, total and dissolved
Biochemical Oxygen Demand (BOD)	
Chemical Oxygen Demand (COD)	
Dissolved Solids	
Fluoride	
Chloride	
pH	
Total Hardness	
Sulfates	

Monthly

Fecal Coliform/100ml

Quarterly

Barium, total	Selenium, total
Beryllium, total	Silver, total

The scope and severity of violations of the specific physicochemical parameters composing the categories used in the matrix were determined for each river basin. Scope is defined as the percentage of the basin impacted by a specific pollutant. This is a subjective rating based on existing physicochemical data. The severity of the impact is also a subjective classification based on the percentage of standards violations at each ambient station during the sampling period 1980-1981.

In each basin the water quality ratings for the nine categories were determined as good, fair, and poor. These determinations are defined as follows:

Good: Water quality standards for selected parameters were exceeded in less than 10% of samples, with the violations occurring in less than 25% of the basin.

Fair: Water quality standards for selected parameters were exceeded in 10% to 33% of the samples, with violations occurring in 25% to 75% of the basin.

Poor: Water quality standards for selected parameters exceeded in 33% or more of the samples, with violations occurring in 75% or more of the basin.

Unknown: No data available.

In the few instances where the combination of scope and severity did not fit into the above criteria, the severity factor was given the most weight in the final determination of the overall water quality rating. The scope of the impacts was considered to be of secondary importance, due to limited station coverage in most river basins.

It should be noted that in some cases, particularily with regards to toxic pollutants, the fact that a problem is not identified may be due to limited monitoring data and not because the problem does not exist.

Due to the Division of Water's limited period of data collection (2 1/2 years), it is difficult to properly assess water quality trends. Trends were estimated by reviewing previous Kentucky 305(b) Reports, assessment of available ambient data, and judgement of personnel experienced in water quality conditions.

Table 2 is a matrix summary of water quality conditions for all major basins in Kentucky. This summary was compiled from a basin-by-basin assessment of water quality conditions and trends for Kentucky for the period 1980-81. The individual basin assessments consist of a basin map, water quality matrix, and a general basin discussion.

Table 2

RIVER BASIN SUMMARY

RIVER BASIN SUMMARY

WATER BODY	YEAR	TEMPERATURE	OXYGEN	pH	AESTHETICS	TROPHIC NUTRIENTS	ORGANIC TOXICANTS	INORGANIC TOXICANTS	BACTERIA	BIOLOGICAL QUALITY	OVERALL	CAUSE(S)	PROBLEM PARAMETERS
Big Sandy													
7 stations	1980	G	G	G	P	F	Δ	F	P	Δ	F	P	FC, P, Fe.
	1981	G	G	G	F	F	Δ	P	P	Δ	F	NP	Hg, Cd
Hydrologic Unit #050702(01-04)	TREND	→	→	→	↑	→	Δ	↓	→	Δ	→		
Little Sandy													
0 stations	1980	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	1981	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Hydrologic Unit #05090104	TREND	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Tygarts Creek													
0 stations	1980	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	1981	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Hydrologic Unit #05090103	TREND	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Licking River													
2 stations	1980	G	G	G	P	P	Δ	P	F	Δ	P	P	Hg, Mn, SS,
	1981	G	G	G	P	P	Δ	F	F	Δ	F	NP	P, Fe,
Hydrologic Unit #051001 (01,02	TREND	→	→	→	→	→	Δ	↑	→	Δ	↑		NO_2+NO_3-N

WATER QUALITY: G = Good
F = Fair
P = Poor
Δ = Unknown

TREND: ↑ = Improving Quality
↓ = Degrading Quality
→ = No detectable Trend
Δ = Unknown

CAUSES: P = Point Source(s)
NP = Non-point
N = Natural
Δ = Unknown

Table 2

RIVER BASIN SUMMARY CONTINUED

RIVER BASIN SUMMARY (continued)

WATER BODY	YEAR	TEMPERATURE	OXYGEN	pH	AESTHETICS	TROPHIC NUTRIENTS	ORGANIC TOXICANTS	INORGANIC TOXICANTS	BACTERIA	BIOLOGICAL QUALITY	OVERALL	CAUSE(S)	PROBLEM PARAMETERS
Kentucky River													
6 stations	1980	G	G	G	F	F	Δ	P	P	Δ	F	P	NO_2+NO_3-N,
	1981	G	G	G	P	P	Δ	P	P	Δ	P	NP	Pb
Hydrologic Unit #051002(01-05)	TREND	→	→	→	↓	↓	Δ	→	→	Δ	↓		
Upper Cumberland													
5 stations	1980	G	G	G	G	G	Δ	P	F	Δ	G		P, Fe, Mn
	1981	G	G	G	G	G	Δ	P	F	Δ	G		
Hydrologic Unit #051301(01-05)	TREND	→	→	→	→	→	Δ	→	→	Δ	→		
Salt River													
3 stations	1980	G	G	G	P	P	Δ	P	P	P	P	P	NO_2+NO_3-N,
	1981	G	G	G	F	P	Δ	P	P	P	P	NP	Pb, Hg, Cd, Fe,
Hydrologic Unit #051401(02,03)	TREND	→	→	→	↑	→	Δ	→	→	→	→		FC
Green River													
11 stations	1980	G	G	G	F	P	Δ	P	F	Δ	F	P	NO_2+NO_3-N,
	1981	G	G	G	F	P	Δ	P	F	Δ	F	NP	Pb, Cd, Hg,
Hydrologic Unit #051100(01-06)	TREND	→	→	→	→	→	Δ	→	→	Δ	→		Fe, P

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F = Fair
P = Poor
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Δ = Unknown

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N = Natural
Δ = Unknown

Table 2

RIVER BASIN SUMMARY CONTINUED

RIVER BASIN SUMMARY WATER BODY	YEAR	TEMPERATURE	OXYGEN	PH	AESTHETICS	TROPHIC NUTRIENTS	ORGANIC TOXICANTS	INORGANIC TOXICANTS	BACTERIA	BIOLOGICAL QUALITY	OVERALL	CAUSE(S)	PROBLEM PARAMETERS
Lower Cumberland													
1 station	1980	G	G	G	G	F	Δ	P	G	Δ	G	P	P, Fe, Mn,
	1981	G	G	G	G	F	Δ	F	G	Δ	G	NP	Cd, Hg
Hydrologic Unit #051307(05,06)	TREND	→	→	→	→	→	Δ	↑	→	Δ	→		
Tradewater													
0 stations	1980	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	1981	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Hydrologic Unit #05140205	TREND	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Tennessee													
1 station	1980	G	G	G	G	F	Δ	F	G	Δ	G	P	P, Fe, Mn,
	1981	G	G	F	G	F	Δ	G	G	Δ	G	NP	
Hydrologic Unit #060400(05,06)	TREND	→	→	↓	→	→	Δ	↑	→	Δ	→		
Mississippi													
0 stations	1980	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	1981	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Hydrologic Unit 080102(01,02)	TREND	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ

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TREND: ↑ = Improving Quality, ↓ = Degrading Quality, → = No detectable Trend, Δ = Unknown

CAUSES: P = Point Source(s), NP = Non-point, N = Natural, Δ = Unknown

Ohio River Main Stem

The Ohio River forms the northern border of the Commonwealth of Kentucky for 664 miles. The river receives impacts from all the major drainages as well as numerous minor basins within the state. In addition, the Ohio receives drainage from a large portion of Pennsylvania, Ohio, West Virginia, Indiana and Illinois.

The Division of Water maintains no water quality monitoring stations on the main stem of the Ohio River. Monitoring of the Ohio main stem and lower reaches of major tributaries is the responsibility of the Ohio River Valley Water Sanitation Commission (ORSANCO), a compact of eight states in the Ohio River drainage basin. Information on water quality of the Ohio River main stem is contained in ORSANCO's Water Quality Report to Congress for the same reporting period.

Big Sandy River Basin

Includes Little Sandy and Tygarts Creek

FIGURE 2

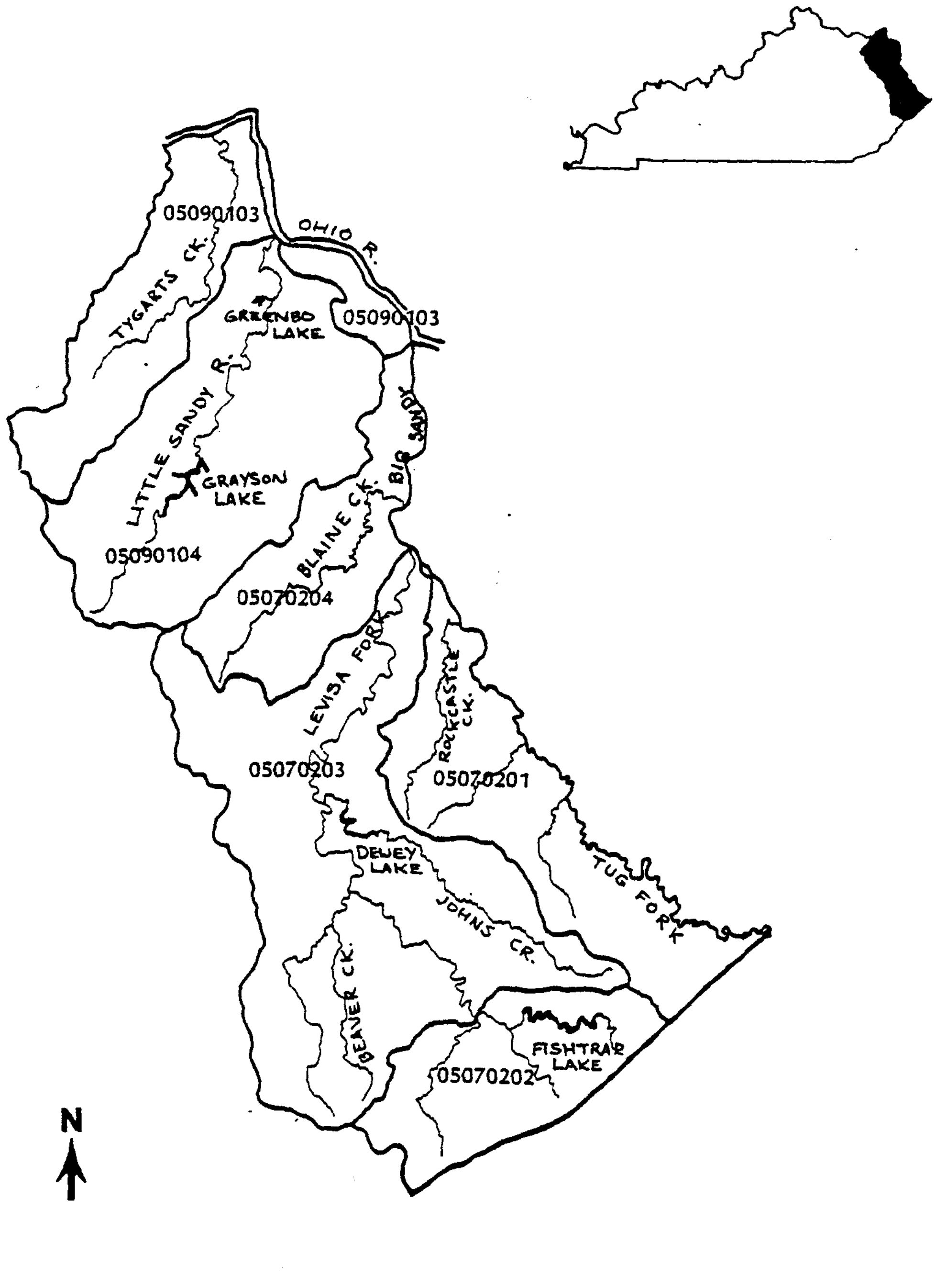

Table 3

Big Sandy River Basin

BIG SANDY RIVER BASIN WATER BODY	YEAR	TEMPERATURE	OXYGEN	PH	AESTHETICS	TROPHIC NUTRIENTS	ORGANIC TOXICANTS	INORGANIC TOXICANTS	BACTERIA	BIOLOGICAL QUALITY	OVERALL	CAUSE(S)	PROBLEM PARAMETERS
Tug Fork													
Hydrologic Unit #05070201	1980	G	G	G	P	F	Δ	F	P	Δ	F	N	Cd, Hg,
	1981	G	G	G	G	F	Δ	P	P	Δ	F	P	Fe, P,
KY Primary Station #01004901	TREND	→	→	→	↑	→	Δ	↓	→	Δ	→	NP	FC
Tug Fork													
Hydrologic Unit #05070201	1980	G	G	G	P	F	Δ	G	P	Δ	F	NP	Hg, Fe,
	1981	G	G	G	F	F	Δ	F	P	Δ	F	N	P, FC
KY Primary Station #01004900	TREND	→	→	→	↑	→	Δ	↓	→	Δ	→	P	
Levisa Fork													
Hydrologic Unit #05070203	1980	G	G	G	F	F	Δ	F	P	Δ	F	P	Cd, Hg,
	1981	G	G	G	G	F	Δ	P	P	Δ	F	NP	Fe, P,
KY Primary Station #01020900	TREND	→	→	→	↑	→	Δ	↓	→	Δ	→	N	FC
Levisa Fork													
Hydrologic Unit #05070203	1980	G	G	G	G	G	Δ	F	P	Δ	G	P	Pb, Cd,
	1981	G	G	G	F	F	Δ	P	P	Δ	F	NP	Hg, Fe,
KY Primary Station #01016901	TREND	→	→	→	↓	↓	Δ	↓	→	Δ	↓		P, FC.

WATER QUALITY: G = Good, F = Fair, P = Poor, Δ = Unknown

TREND: ↑ = Improving Quality, ↓ = Degrading Quality, → = No detectable Trend, Δ = Unknown

CAUSES: P = Point Source(s), NP = Non-point, N = Natural, Δ = Unknown

Table 3

Big Sandy River Basin continued

BIG SANDY RIVER BASIN (continued)

WATER BODY	YEAR	TEMPERATURE	OXYGEN	pH	AESTHETICS	TROPHIC NUTRIENTS	ORGANIC TOXICANTS	INORGANIC TOXICANTS	BACTERIA	BIOLOGICAL QUALITY	OVERALL	CAUSE(S)	PROBLEM PARAMETERS
Paint Creek													
Hydrologic Unit #05070203	1980	G	G	G	G	G	Δ	G	G	Δ	G	P	Hg, Fe,
	1981	G	G	G	G	G	Δ	F	F	Δ	G	NP	
KY Primary Station #01015900	TREND	→	→	→	→	→	Δ	↓	↓	Δ	→	N	
Blaine Creek													
Hydrologic Unit #05070204	1980	G	G	G	F	G	Δ	F	P	Δ	F	P	Hg, Fe,
	1981	G	G	G	G	G	Δ	F	F	Δ	G	NP	SS, FC
KY Primary Station #01003900	TREND	→	→	→	↑	→	Δ	→	↑	Δ	↑		
Big Sandy River													
Hydrologic Unit #05070204	1980	G	G	G	P	F	Δ	F	P	Δ	F	P	Hg, Fe, Mn,
	1981	G	G	G	P	F	Δ	F	P	Δ	F	NP	SS, P, FC
NASQAN #03215000	TREND	→	→	→	→	→	Δ	→	→	Δ	→		
	1980												
	1981												
	TREND												

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F = Fair
P = Poor
Δ = Unknown

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Δ - Unknown

Big Sandy River Basin

050702 (01, 02, 03, 04)

The Big Sandy River basin lies in the rugged mountains of the Cumberland Plateau in eastern Kentucky and adjacent West Virginia and Virginia. The basin is underlain by sandstone deposits of Pennsylvanian age. The total drainage area is 4,280 square miles, 2,885 of which are in Kentucky.

The main stem of the Big Sandy River originates at the confluence of the Levisa and Tug Fork at Louisa, Kentucky, and flows north 27 miles to enter the Ohio River (mile 317.1) at Catlettsburg, Kentucky. Levisa Fork flows 130 miles in Kentucky with a drainage area of 1,471 square miles. Principal tributaries of the Levisa Fork include Paint Creek, Russell Fork, Beaver Creek, and Johns Creek. Tug Fork forms the boundary between Kentucky and West Virginia for about 94 miles and has a drainage area within the state of 476 square miles. Principal tributaries to the Tug Fork within the state include Rockcastle Creek, Wolf Creek, and Big Creek.

The elevation of the Big Sandy River ranges from 2,400 feet above mean sea level (m.s.l.) at the head of Levisa Fork and 2,200 feet above m.s.l. at the head of Tug Fork to 498 feet above m.s.l. at its confluence with the Ohio River. The average main stem slope of the Big Sandy is 9.9 feet/mile while many of its tributaries have average slopes of over 50 feet/mile.

Steep terrain and shallow soil depths account for the limited agriculture in the basin. Localized silviculture operations also occur throughout the drainage. The mainstay of the economy lies in the vast coal reserves underlying the basin. Both surface and deep mining, and to a lesser extent several small petroleum fields, provide jobs for most of the residents.

Impacts

The principal impacts to the streams in Big Sandy River basin are increased siltation and to a lesser extent increased nutrient enrichment. Acid mine drainage is limited to a few localized areas in the upper half of the drainage. The lower 12 miles of the main stem receive at least 5 industrial discharges which impact this section of the stream. Oil and gas drilling have degraded the water quality in the Blaine Creek and Johnson Creek subbasins. Other impacts are road construction, domestic sewage, urban runoff and agriculture.

The aquatic biota has been adversely affected by surface mine runoff over a large portion of the drainage. Essentially every major watershed has been impacted to some degree by surface mining. Water quality perturbations have been so extensive in some localized areas as to virtually eliminate the aquatic fauna. One fish kill was reported for each year (1980, 1981) in the Kentucky portion of the drainage.

o Flow

The average discharge for the period of record (53 years) is 2,514 cfs for the Levisa Fork at Paintsville river mile 65.2. Mean discharge for water year 1980 was slightly below the annual average discharge (-3%). However, during water year 1981, the mean discharge was 34% below the annual average. The concentration effect of flow reduction during the reporting period was a contributing factor to observed increases in certain physicochemical parameters.

- Dissolved Oxygen (DO) and Temperature

There were no water quality violations for these parameters during the report period. DO levels averaged 8.7 mg/l throughout the basin, with a maximum of 17.0 and a minimum of 4.5 mg/l.

- Acidity, Alkalinity and pH

There were no violations of pH standards during the reporting period. Average pH throughout the basin was 7.25. Acidity averaged 4.4 mg/l and alkalinity 70.1 mg/l.

- Conductivity

An elevated mean conductivity value of 408 μmhos/cm was recorded, reflecting the impact of mining and oil drilling activities within the basin.

- Chlorides and Sulfates

Chloride levels were elevated at two stations, Blaine Creek (mean = 261.7 mg/l) and Paint Creek (mean = 55.8 mg/l). These levels may be attributed to the oil drilling operations in the basin. Sulfate levels are also elevated at four stations, probably due to the extensive mining in the drainage.

- Fecal Coliform

Fecal coliform standards were exceeded 62% of the time in both 1980 and 1981. The Levisa Fork near Pikeville had 100% violations in both 1980 and 1981, while the Tug Fork station near Kermit had 100% violations in 1980 and 87.5% violations in 1981. All stations showed at least one violation. This appears to be a severe and widespread problem and would preclude primary contact recreation in most streams.

o Heavy Metals

Violations of public water supply and aquatic life standards for manganese, iron and lead were both severe and widespread. Cadmium and mercury violations were moderate in both severity and scope.

Little Sandy River Basin

05090104

The Little Sandy River basin is located in the northeastern portion of the state, lying within the Unglaciated Appalachian Plateau. The area is underlain with Pennsylvanian age sandstone deposits. The river arises near Sandy Hook, Kentucky, and flows 87 miles to its confluence with the Ohio River at Greenup, Kentucky (Ohio River mile 336.4). Principal tributaries to the Little Sandy include the Little Fork, East Fork and Big Sinking Creek. The major impoundment of this area is Grayson Lake near Grayson, Kentucky. The basin drains an area of 721 square miles.

The topography in the headwater section is generally rugged, with no flat or undulating land present. Closer to the mouth, the terrain becomes less rugged with more bottomland available for agricultural practices.

Elevations range from 1,300 feet above mean sea level (m.s.l.) in the headwater region near Sandy Hook to 479 feet above m.s.l. at the river's confluence with the Ohio. Average slope for the Little Sandy is 8.3 feet/mile.

Impacts

The major impact in the Little Sandy River basin is coal mining which contributes increased sediment loads to the receiving streams. Domestic sewage and agricultural runoff are minor impacts. Siltation resulting from coal mining operations have adversely affected the aquatic biota in the Little Sandy basin. One fish kill was reported in 1980, and none in 1981.

o Flow

The annual average discharge for the period of record (42 years) is 482 cfs for Little Sandy at Grayson, mile point 38.05. Mean discharge for water year 1980 was slightly below the annual average discharge (-4%). However, during water year 1981, mean discharge was 42% below annual average.

Tygarts Creek Basin

05090103

The Tygarts Creek basin is located in the northeastern portion of the state, lying within the Unglaciated Allegheny Plateau region of the Appalachian Plateaus Province. The bedrock in the headwaters is Pennsylvanian sandstone but as the stream flows northward it cuts into Mississippian limestone deposits. Tygarts Creek originates in southwestern Carter County, Kentucky and flows in a northeasterly direction for its 89.3 miles, where it empties into the Ohio River at South Shore, Kentucky (mile point 353.2). The principal tributary is Buffalo Creek with a drainage area of 54 square miles. The entire basin has a drainage area of 339 square miles.

The topography for the watershed varies from steep hillsides and narrow valleys in the headwaters to broad, wide valleys near the mouth. Elevations range from 485 feet above mean sea level (m.s.l.) at its confluence with the Ohio River to 1300 feet above m.s.l. at the source. The average slope of Tygarts Creek is 6.9 feet/mile. The average stream channel width ranges from about 30 feet in the headwater reaches to over 200 feet near the mouth.

Impacts

Municipal sewage from the city of Olive Hill is the main impact on Tygarts Creek, with some minor impacts from mining and oil drilling operations.

Tygarts Creek supports a diverse assemblage of aquatic organisms throughout the drainage. No fish kills occurred during the reporting period.

o Flow

The annual average discharge for the period of record (40 years) is 310 cfs for Tygarts Creek at Olive Hill at mile point 78.0. Mean discharge for water year 1980 was slightly below the annual average discharge (-6%). However, during water year 1981, mean discharge was 43% below annual average.